OPPORTUNITIES AND CONSTRAINTS REPORT

COLORADO LAGOON
RESTORATION FEASIBILITY STUDY

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City of Long Beach

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EXECUTIVE SUMMARY

The Colorado Lagoon site possesses a variety of opportunities and constraints to restoration. This study itemizes opportunities and constraints to restoration, and provides initial descriptions of alternatives. It is intended to establish the basis for community discussion to generate alternatives that will move forward for analyses.

Essentially, urban encroachment has occurred that presents direct constraints (e.g., hardscape, infrastructure, the culvert), while also creating indirect constraints to restoration (e.g., contaminated sediments). Other constraints pertain to the existence of sensitive habitat on-site and legal restrictions. Opportunities for restoration are also abundant and include pulling back the encroachment, improving the culvert for flushing, creating buffers and additional habitat areas, improving existing habitat, and managing and improving public use elements.

Assessing opportunities and constraints leads toward identification of components that would comprise alternatives. Alternative components include cleaning or entirely removing the culvert, removing contaminated and compromised sediment, re-creating more native habitat, installing buffers and screens to surrounding uses, installing access trails, interpretive kiosks and an educational center, and management of watershed practices. Alternatives have been initially conceived that range in degree of site modification and probable construction costs from minimal, moderate to maximal. Specific alternative actions are presented. These alternatives will be refined for the upcoming "Develop and Evaluate Restoration Alternatives" deliverable.

TABLE OF CONTENTS

FIGURES

1.0 INTRODUCTION

Colorado Lagoon is a tidal lagoon in the City of Long Beach and is connected to Alamitos Bay and the Pacific Ocean through a tidal culvert to Marine Stadium. The goal of the Colorado Lagoon Restoration Feasibility Study is to evaluate and recommend feasible alternatives to restore the marine ecosystem and support safe recreation while improving water and sediment quality and managing storm water in Colorado Lagoon.

The purpose of this report is to identify the constraints and opportunities that drive the feasibility of potential restoration alternatives. This report integrates results from previous tasks to develop a systematic overview of the project area and determine the opportunities and constraints to habitat restoration.

The following constraints have been identified and are described further in Section 3.0:

- Urban Encroachment
- Limited Culvert Capacity
- Use of the Lagoon as a Storm Drain Basin For Upstream Watershed Area
- Flood Control For Surrounding Areas
- Safe Swimming
- Special Status Species Considerations
- Contaminated Sediments Disposal Options
- L.A. County Sanitation District Capacity Limitations
- Coastal Act Restrictions
- Local Coastal Program Requirements
- City of Long Beach Staff Limitations
- Golf Course Use

The following opportunities have been identified and are described further in Section 4.0:

- Areas to Pull Back Encroachment to Create Buffers and/or Restore Habitat
- Culvert Connection Improvement
- Watershed Improvement
- Synergy with Proposed Termino Avenue Drain Project
- Use of Greenbelt for Treatment Wetland / Water Detention Basin
- Local Community Stewardship
- Public Use Enhancement

2.0 SCOPE OF WORK

This study includes the following tasks:

1. Develop a systematic overview of the project areas;
2. Determine opportunities and constraints for habitat restoration; and
3. Describe preliminary restoration alternatives.

3.0 CONSTRAINTS

The following section provides a list of constraints which must be considered in developing the restoration alternatives. Some of these constraints are hard constraints which are not flexible (e.g. surrounding residential neighborhoods encroaching on the lagoon), while some may be able to be modified to address the constraint (e.g. improving upon the existing culvert connection tidal restriction). None of the constraints listed below make restoration unachievable. Although not listed below, available funding is another obvious constraint which may influence the selection of the alternative to be implemented. Sets of photographs are included in the sections that pertain to the accompanying text.

3.1. *URBAN ENCROACHMENT*

The Colorado Lagoon is in the midst of an urban setting and thus is encroached upon on all sides. This encroachment constrains the amount of land available for improvement options, (especially upland/transition zones), and affects the potential viability of habitat due to human and urban predator (e.g. dogs, cats) disturbance. Figure 1 shows the physical boundary limitations imposed upon the lagoon by the surrounding areas; these are described further below. Many of these hardscape features cannot be modified, while others could potentially be modified to allow more area for lagoon functions.

Figure 1 - Urban Encroachment

3.1.1. Residential Areas

There are residential neighborhoods immediately to the east, west and south of the lagoon. *These cannot be modified.*

3.1.2. Paved Streets All Around Perimeter

The lagoon is bounded by Park Avenue to the west, Appian Way and Colorado Street to the south, Orlena, Haines and Monrovia Avenues to the east, and 6th Street to the north. *These cannot be modified.*

3.1.3. Golf Course Along North Shore And Western Arm

There is a City-owned (privately-operated) nine-hole golf course immediately adjacent to the Colorado Lagoon. This constrains the amount of land available for upland/transitional habitat. Photos below show the golf course boundary; the boundary is a combination of chain-link fencing and no fencing/boundary designation. It should be noted that the City of Long Beach Local Coastal Program (LCP) specifically calls for examination of the land distribution between the lagoon and the golf course. *This boundary can be modified.*

3.1.4. Parking Lot Along North Shore

There is a small paved parking lot on the northern shore between the sandy beach and the golf course fenceline as shown below. This lot provides parking for the grassy picnic areas just to the east and west of the parking lot. *This lot can be modified.*

3.1.5. Access Road Along Western Shore Of Northern Arm

There is a paved road on the western shore of the north arm which provides access to the northern lagoon parking lot from 6th Street as shown below. The access road is gated at the 6th Street entrance and is only open during daylight hours. The road is used by both vehicles and pedestrians. The banks along the edge of the roadway are eroding. The road constrains the amount of space available for upland/transitional habitat and/or for a pedestrian trail. *This road can be modified.*

3.1.6. Golf Course Tee Off Over Lagoon Western Arm

The golf course 7th hole long-tee location results in golfers teeing off over the lagoon (and many balls actually land in the lagoon) as shown below. There does not appear to be space available to relocate this hole for the long-tee so that it is not over the lagoon. *The interface of the lagoon and the golf course can be modified or screened to reduce errant balls entering the lagoon.*

3.1.7. Human Disturbance

Because Colorado Lagoon is a popular recreational area (swimming, walking, picnicking, fishing, etc.), opportunities to restore native habitat and to provide habitat for special status species are constrained by the fact that the area will always be subject to a high level of human-related disturbance. This human disturbance also manifests itself as litter left at the lagoon. *Human activities should be maintained and improved.*

3.1.8. Urban Predators (Dogs, Cats, Etc.) Impact On Wildlife

The lagoon is frequented by people walking their dogs, which are often allowed to go off-leash (although this is illegal). There are also cats, opossums, squirrels, and rats in the area. In the past, a coyote, fox, raccoon, and skunk have been sited. These potentially pose a threat to wildlife, in particular birds, at the lagoon.

The opportunity to provide nesting habitat for birds, especially ground nesting birds like the state and federal endangered California least tern and the federal threatened western snowy plover, and birds such as the state endangered Belding's savannah sparrow that nest on low shrubs, is constrained by the fact that these birds will be vulnerable to the urban-associated predators. *Urban predators' influence can be modified.*

3.2. *LIMITED CULVERT CAPACITY*

The culvert size / condition / marine growth are limiting the amount of tidal flushing between the Marine Stadium and Colorado Lagoon. Measured tide data show that the low tide in the lagoon is perched above that of Marine Stadium and the ocean by approximately two feet, representing a reduction from the full ocean tide range by approximately 33%. There is also a tidal time lag between the Marine Stadium and the lagoon which further reduces tidal exchange. Extensive marine growth within the culvert and sills on both ends impede flow. Tide gates are usually left open, but are not currently able to open fully to their design capability, due to degradation of the gates over the years. These tidal culvert influences were previously discussed in detail in the "Colorado Lagoon Tidal and Flood Hydraulics Study" deliverable. *The culvert condition and operation can be modified.*

3.3. *USE OF THE LAGOON AS A STORM DRAIN BASIN*

Colorado Lagoon is a natural low point in a 1,172 acres watershed (City of Long Beach, 2003). Four major storm drain systems, plus seven additional local drains, outfall into the lagoon. This impacts the water quality of the lagoon. *Use of the lagoon as a storm drain basin cannot be modified, although perhaps the number of storm drains and their discharge into the lagoon could be reduced.*

3.4. *FLOOD CONTROL*

The lagoon serves to convey floods from the watershed. It must be ensured that any proposed alternatives maintain or enhance this function and do not increase flooding risk in the surrounding areas. *This constraint cannot be modified.*

3.5. *SAFE SWIMMING*

Colorado Lagoon is a designated recreational swimming area (shown below), and as such is required to meet the human health water quality standards of AB411 and should remain attractive and inviting to swimmers. This potentially constrains the availability of certain lagoon areas for habitat restoration. *This constraint cannot be modified.*

3.6. *SPECIAL STATUS SPECIES CONSIDERATIONS*

A number of special status bird species occur or potentially occur in Colorado Lagoon. Activities associated with lagoon restoration potentially could temporarily disturb birds using the lagoon. For most of the special status bird species that could occur in the lagoon, temporary disturbance of a small portion of their foraging habitat would not be a significant impact. However, depending on the extent of the disturbance, temporary loss of foraging habitat by the state and federal endangered California least tern could be a significant impact. Least terns use quiet areas such as Colorado Lagoon to train their young to forage after the chicks have fledged. Therefore, mitigation measures, such as performing activities such as dredging outside the least tern nesting season, may be necessary to protect this species. The City of Long Beach should consult with the U.S. Fish and Wildlife Service regarding potential impacts to least terns once a restoration plan has been identified. *This constraint cannot be modified.*

3.7. *CONTAMINATED SEDIMENTS DISPOSAL OPTIONS*

There are constraints to available sediment disposal/reuse options because of the types and levels of contaminants found in the lagoon sediment. The sediments in the western arm must be removed. Sediments in the central lagoon could remain in place. *The constraints of sediment disposal options cannot be modified.*

3.8. *LA COUNTY SANITATION DISTRICT CAPACITY LIMITATIONS*

A potential alternative to improve water quality is by diverting low flows from selected Colorado Lagoon storm drain outfalls to the sanitary sewer. This involves collecting the dry weather runoff and diverting it to the County's sanitation treatment plant in Carson. However, the amount of runoff that can be diverted is limited by the treatment capacity of the County's treatment plant and the size of the sewer trunk line(s) in the lagoon area (Boyle, 2003). Based on preliminary discussions with County Sanitation District personnel, the dry weather runoff diversion capacity for the Colorado Lagoon area is approximately 400 gallons per minute (gpm), of which 150 gpm are to be diverted as part of the Termino Avenue Drain Project (County of Los Angeles, undated). There are also County-imposed restrictions limiting the diversion to only certain times of the day. *The County constraints cannot be modified.*

3.9. *COASTAL ACT RESTRICTIONS*

Per discussion with Coastal Commission staff (personal communication with Charles Posner, 8/25/04), it must be ensured that no sensitive marine biota are destroyed by cleaning the culvert; as such, there will be a need to do a biological survey of the culvert if this cleaning alternative is recommended. *This constraint cannot be modified.*

3.10. *LCP REQUIREMENTS*

The 1980 City of Long Beach Local Coastal Program (LCP) includes a Resource Management Plan (RMP) which applies to the Colorado Lagoon (as well as four other waterlands in Long Beach). The RMP is designed to be responsive to the mandates and guidelines of the Coastal Act of 1976. The RMP *"is an implementation plan, providing processes and actions to carry out the intent of the Act and the desires of the citizenry consistent with and responsive to the Act"*. The Colorado Lagoon RMP *"aims to upgrade the whole facility while keeping it open and unfenced for aesthetic, swimming and clamming enjoyment both by visitors and by local residents so that its quality will remain upgraded. Water quality will be improved by urban runoff control and scientifically determined tidal gate regimens. Structures, equipment and landscaping will be improved and increased. The north bank area will be made more scenic and useful to local users by erosion control and landscaping, and possibly by the addition of two acres of a grassed and shaded picnic area. Public health will be guarded by frequent testing and posting of bilingual warnings during hazardous conditions."* Specific recommendations within the Colorado Lagoon RMP include:

- The major storm drains emptying into the west and north arms should be diverted to the ocean or the San Gabriel River. (This recommendation was specifically addressed in the previously delivered Colorado Lagoon Restoration Feasibility Study Water Quality Assessment Report). *****
- Sediments deposited by the storm drains should be removed and replaced with sand and then the clams should be rebedded.

- Establish controls on recreation for maintenance of the (Cherrystone) clam population (if it exists).
- Provide directive signs and other amenities to encourage maximum use of the north beach and parking lot. *
- The City Health Department should monitor clams to preclude human ingestion of toxic materials. Signs should be posted for hazardous conditions regarding clam edibility. *
- A children's play module should be provided on the south shore. *
- Public access will not be impeded by fencing or closure of gates. *
- Water quality, not water level, will dictate tidal gate regimens.
- During the "off-season for swimming," water quality will be tested weekly * and daily after each rain storm. During the summer swimming season, water quality will be tested daily.
- The State Fish & Game Department will be responsible for the health of the clams.
- Beaches and swimming areas will be maintained with sandy banks and bottoms. *
- All sandy surfaces will be kept clean of sediments, debris and organic growth.
- Chemicals will not be introduced into the water to effect sanitary water quality for swimming purposes. *
- Tributaries of the storm drains will be monitored to prevent illegal discharges. *
- Correct the problem of golf course runoff polluting the lagoon water and eroding the perimeter grounds.
- The land distribution between the golf course and the lagoon will be addressed.
    - The plan specifically discusses a study which would add a strip of grassy land to the north area of the Colorado Lagoon (around two acres), by slicing off a strip of the adjacent golf course, from the restroom all along the north beach road to 6th Street, by moving the fence into the golf-land area about fifty to a hundred feet.
- Landscaping will be installed between Park Avenue and the northwest corner of Colorado Lagoon. The area between this and the water will be grassed and equipped for picnicking, but not for swimming in the adjacent water.
- The tree-shaded areas along the south bank will be equipped and maintained with grassy areas and picnicking facilities and tables. *

Some of these recommendations have already been addressed; these are noted by an asterisk (*). The remainder will be used as guidelines for developing and assessing alternatives. *These constraints cannot be modified.*

3.11. *CITY OF LONG BEACH STAFF LIMITATIONS*

Increased staff would be needed for the following watershed improvement initiatives:

- Construction inspection / enforcement
- Commercial area inspection / enforcement
- Overwatering enforcement
- Increased street sweeping
- Storm sewer drop inlet / catch basin filter maintenance

The City is under tight budget limitations and staffing for these initiatives may not be available. *This constraint may be able to be modified.*

3.12. *GOLF COURSE USE*

The Recreation Park Golf Course is one of the premier public golf courses in the area and course fees, which are utilized by the City for other public uses, rely on its playability as viewed by the golfers. Restoration alternatives should not diminish the course viability that would result in reduced play and revenues. *This constraint cannot be modified.*

4.0 OPPORTUNITIES

Fortunately, there are several opportunities to restore habitat while maintaining recreation and flood control functions at the Colorado Lagoon. In general, habitat restoration at the lagoon could be enabled through improved water and sediment quality, elimination of non-native plants and establishing an environment conducive for native plants. A discussion of the overall potential to enhance and restore particular plants and animals at the lagoon is followed by a discussion of specific ways (opportunities) to do this. Sets of photographs accompany the discussion.

4.1. *HABITAT POTENTIAL*

- Colorado Lagoon supports an abundance of fishes and a diverse infaunal invertebrate community except in the western arm. The impoverished invertebrate community in the western arm most likely is related to poor water and/or sediment quality. Therefore, improvement of water and sediment quality in Colorado Lagoon would enhance the benthic invertebrate community in the western arm. In addition, arrow gobies (fish) are scarce in the western arm. Improved water quality might enhance the environment for arrow gobies.
- Juvenile halibut do not use Colorado Lagoon as a nursery area. The reason for the lack of juvenile halibut in the lagoon is unknown. Improvement in water quality might improve the ability of the lagoon to support juvenile halibut. Juvenile halibut also might be inhibited from entering the lagoon by the tidal constriction at the culvert. Improved tidal flushing might increase the chance that juvenile halibut would enter the lagoon.
- Eelgrass beds enhance the marine environment of bays and harbors. They provide attachment, food, and shelter for invertebrates and shelter for fishes. They also help to stabilize sediments. Presently, eelgrass in Colorado Lagoon is too sparse to provide much habitat benefit. Eelgrass beds can be established by transplanting

eelgrass from an area, such as Marine Stadium, where substantial beds occur. However, the fact that eelgrass occurs in Colorado Lagoon but has not proliferated suggests that water quality in the lagoon may be inhibiting establishment of beds. Eelgrass is light sensitive and the excessive turbidity in Colorado Lagoon, especially during the summer growing season, may be preventing it from spreading. Therefore, improved water quality and tidal flushing probably would improve the chances that eelgrass beds could become established in the lagoon.

- Shorebirds forage on intertidal mudflats and sand flats. Presently this habitat is limited in Colorado Lagoon. The intertidal area consists of a narrow band around the lagoon and the beaches in the central portion of the lagoon. The beach areas are heavily used by humans. Shorebirds are disturbed by human activity, and particularly by dogs. If human use could be confined to the southern shore of the central portion of the lagoon, there may be an opportunity to provide intertidal habitat for shorebird foraging on the north shore and/or on the western arm shores. It might be possible to increase the band or area of tidal influence either by resloping the beach or increasing tidal flushing or both. If the intertidal areas were increased, there would be more foraging areas for shorebirds. In addition, shorebird use of the northern and western arm areas would be enhanced if human use was managed. Perhaps the beach could be fenced and viewing platforms provided with information on the types of shorebirds that occur and the importance of intertidal foraging habitat. Enhancement of intertidal foraging area for shorebirds would have the potential of benefiting sensitive shorebird species such as the federal threatened western snowy plover and the long-billed curlew, a California Species of Special Concern.
- Pickleweed and saltgrass are limited to a narrow band surrounding the lagoon. It might be possible to increase both the quantity and quality of this habitat by expanding the width of this band. Along the west shore of the northern arm, the bank is steep and pickleweed appears to be in poor shape because it is inundated too frequently. If the steep bank could be graded to a longer, gentler slope the width of the salt marsh band could be increased and habitat could be provided for pickleweed above the mean higher high water line where it is inundated less frequently and grows better. Along the eastern shore of the north arm, salt marsh is being invaded by iceplant. Removal of iceplant would enhance the saltmarsh habitat in this area. In the western arm, salt marsh is being mowed by the gardeners responsible for upkeep of the turf in the adjacent golf course. Marsh vegetation would be enhanced in these areas by designating it off-limits to restrict golf course gardeners from interfering with it.
- Marsh habitat could be increased in diversity by introducing native species, including special status plants such as saltmarsh bird's beak, that currently are not present at Colorado Lagoon. The habitat also should be protected from human disturbance by signs and possibly fencing, native shrub buffers, and walkways. Signs depicting salt marsh plants and explaining the salt marsh ecosystem would provide public education and would help people to understand why it is important not to disturb this habitat.
- Low tidal marsh habitat characterized by cordgrass (Spartina foliosa) does not exist at Colorado Lagoon. Cordgrass grows between mean high water and mean higher high water in California estuaries. Cordgrass usually does best in areas that have a full

tidal range. It may be possible to establish cordgrass in Colorado Lagoon if the tidal range could be increased or conditions improved. Cordgrass probably would need to be established by planting.

- Almost the entire upland habitat surrounding Colorado Lagoon consists of landscaping and non-native plants. The introduction of native plants would attract more species of birds and would enhance the ecosystem. Opportunities to establish upland habitat could include replacement of non-native trees with native tree species such as western sycamore (Platanus racemosa). Scrub habitat consisting of native shrubs could be planted as a buffer around the upland edge of the lagoon and also between the lagoon park and the golf course. Native shrubs could be used as a buffer around sensitive marsh habitat to discourage human intrusion into the marsh.
- There may be potential to establish nesting habitat for sensitive bird species such as California least terns, western snowy plovers, Belding's savannah sparrow, and osprey. However, establishment of nesting habitat is problematic because of the high human use of the lagoon and the presence of predators (dogs, cats, raccoons, skunks, and possibly red fox and coyote). The safest way to provide nesting areas would be on one or more islands in the center of the lagoon. A sandy nesting area for snowy plovers and least terns could be created within the lagoon. Nesting islands provide protection from mammalian predators and human disturbance. However, construction of a nesting island would reduce the tidal prism of the lagoon and might conflict with measures to improve water quality. An osprey nesting platform could be constructed in the center of the lagoon; however high human use of the area might discourage this species from nesting in the lagoon.
- There might be some potential to establish Beldings savannah sparrow breeding habitat if pickleweed marsh around the edges of the lagoon was expanded and enhanced in quality. However, it would be very difficult to protect the sparrow nests from mammalian predators. Also, because the area available for salt marsh is so limited, the pickleweed habitat may be too small to support a viable population of this non-migratory species.

4.2. *AREAS TO PULL BACK ENCROACHMENT TO CREATE BUFFERS AND/OR RESTORE HABITAT*

The following areas currently encroach upon the lagoon habitat, but have been identified as potential areas to utilize for water quality improvement and/or habitat restoration.

4.2.1. North Arm - 6th St. Access Road

Remove the access road as shown on the following page and/or make it narrower; utilize this land to:

- Recontour and biostabilize banks to take care of erosion problems and to provide marsh habitat and upland transition,
- Create walking path parallel to road.

4.2.2. North Shore Golf Course Fenceline

Remove the existing chain-link fence shown below and replace it with a bio-swale/berm/ fence combination along the golf course perimeter; this would help to treat runoff from the golf course and would improve the aesthetics of the golf course / lagoon boundary. Some sort of fencing would still be required to restrict golfers from using the lagoon area, but the vegetation along the fence would improve the aesthetic appeal.

4.2.3. Western Arm – Golf Course Grass Area And Sandy Beach West Of Lifeguard Station

There is a large open grassy area at the western tip of the western arm shown below which is part of the Recreation Park Golf Course, but is not used by golfers. There is also a large open sandy area along the southern shore of the western arm (west of the lifeguard station) that is not usually frequented by beachgoers or swimmers. These open areas would be ideal for upland/transitional habitat due to the space available and the limited human disturbance. A trail could be installed at this location for interpretation.

4.2.4. West Arm - Golf Course 7th Tee

Based on discussions with golfers at the site, it does not appear that there is an opportunity to relocate the 7th hole. To protect the lagoon from golf balls would require installation of a screen or elimination of the 7th hole long-tee option.

4.2.5. Steep Slope Areas - West Arm Along Golf Course, Areas Adjacent To The Culvert, And Northern Tip Of North Arm

There are steep slopes along several sections of the lagoon as shown below; these steep slopes are not conducive to intertidal habitat. There are open grassy areas just inland of these steep slopes which provide opportunities to regrade and flatten the shoreline slopes. This would impart more tidal prism to create/improve intertidal and marsh habitats in these areas.

4.2.6. Eastern Shore

Replace non-native iceplant (shown below) on eastern shore with native plants.

4.2.7. Northern Shore – Low Public Use Areas

The sandy beach area on the northern shore of the lagoon is not frequently used by swimmers and beachgoers. There is a public restroom on this side (shown below) which is not heavily used and is frequently locked. Vehicles often park in the northern shore parking lot to use the adjacent grassy picnic areas, but it has been observed that this lot is rarely full. This is an opportunity to make the parking lot smaller and utilize the land, including perhaps some of the sandy beach area, for bio-swales and berms and habitat area.

4.3. *CULVERT CONNECTION IMPROVEMENT*

Several opportunities exist to either improve the Marine Stadium / Colorado Lagoon culvert connection visible in the image below, or modify the connection in some manner to improve tidal flushing and resultant water quality.

4.3.1. Clean Out The Inside Of The Culvert

There is extensive marine growth on the inside walls of the culvert and debris trapped within the tide gate trash screens on both ends of the culvert (shown below). The original culvert design includes removable access panels on the top that provide access for small bulldozers to be used to scrape the interior walls and floor. These access openings are large enough to allow small cleaning equipment to be lowered into the culvert by crane. However, the culvert has not been cleaned since its construction in the 1960s. The tide gate trash screens are accessible from either end and could be cleaned of debris to increase flow rate into and out of the culvert.

4.3.2. Remove Structural Impedances

Based on discussion with former City staff (George Johnson), it is thought that a structural sill may be present within the culvert. This sill would have been installed to prevent the water level in the lagoon from falling below a certain depth and thus muting low tide levels within the lagoon. Further investigation is required to determine if this sill does exist and if it does, this obstruction could be removed.

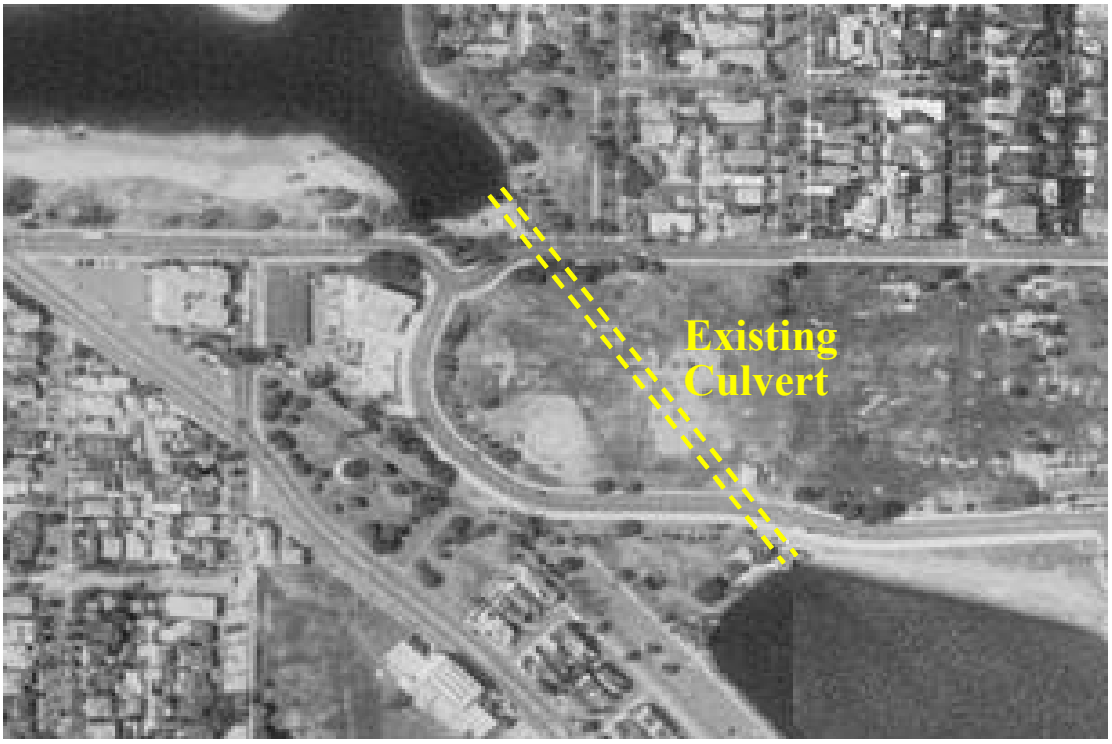
On the Marine Stadium side, a stone sill exists at the entrance to the culvert (shown below) which causes impedance. Removal of these rocks could slightly improve the flow.

4.3.3. Open The Tide Gates Completely

The culvert tide gates shown below were (theoretically) designed to be able to open another 1 1/2 feet in height. However, lack of maintenance has caused the gates to not operate to this design capability. Further investigation is required, but repair of the gates could potentially restore this capability.

4.3.4. Replace Box Culvert With Open Channel

The open park space between the Marine Stadium and Colorado Lagoon (shown in the image below) could be utilized for a new channel location if the existing concrete box culvert were removed and replaced with an open channel through the parkway. The most dramatic improvement in habitat quality would result. Creating an open channel would result in minimal tidal muting and a reduced tide lag, and corresponding improvement in flushing and water and habitat quality. Several members of the public and the Citizens Advisory Group suggested removing the culvert and leaving an open channel. In addition, a walking path could be installed along the banks of the channel, such that there would be a contiguous path around the lagoon, along the channel banks and to the Marine Stadium (a river-park system effect).



4.4. *WATERSHED IMPROVEMENT*

The following opportunities exist to improve the water quality of the lagoon by reducing the amount of pollutants entering it from the watershed through the use of Best Management Practices (BMP). These BMP opportunities were identified as a result of specific observation of current practices within the lagoon's upstream watershed area.

4.4.1. Increase Enforcement At Construction Areas

Code enforcement should be notified of the need to ensure that proper best management practices (BMP's) are implemented at construction sites. Regular drive-through of Basin 21 should be performed to detect un-permitted construction activities.

4.4.2. Increase Education At Commercial Areas

Educational materials should be distributed, and/or developed for distribution, to commercial properties identifying the rules related to power washing impervious surfaces, waste storage, and over watering. Follow-up inspections should be performed and appropriate enforcement administered to recurring violators of established regulations.

4.4.3. Reduce Over-Watering

Educational materials should be distributed along with monthly water bills to residences and businesses within Basin 21. The material should identify the need to eliminate runoff from lawn watering activities to the storm drain system. The Long Beach Recreation Golf Course should develop a plan to stagger watering of fairways and greens during non-operating hours rather that saturation watering at one time. Soil moisture probes can be used to automatically shut off watering before runoff to the sanitary sewer occurs.

4.4.4. Implement Pesticide/Herbicide Management Plan At Recreation Park Golf Course

The Long Beach Recreation Golf Course should develop a Pesticide/Herbicide Management Plan to eliminate the potential for transport of chemicals off golf course property. The Plan should emphasize the use of natural organic pesticides and herbicides to reduce any potential impact on the Colorado Lagoon.

4.4.5. Increased/Improved Street Sweeping

Concentrated commercial corridor street sweeping can be increased to reduce the amount of solid waste and sediment reaching the Colorado Lagoon. Sweepers in these areas should be of the vacuum type to reduce the potential to push debris into the storm water sewer system.

4.5. *SYNERGY WITH PROPOSED TERMINO AVENUE DRAIN PROJECT*

The County of Los Angeles is already considering an alternative to divert one of the major storm drains (at the western tip of the lagoon western arm) away from the lagoon and into the Marine Stadium (this is being done as part of the County's Termino Avenue Drain Project or TADP). This storm drain serves approximately 25% of the Colorado Lagoon watershed area and thus elimination of this drain would greatly reduce the amount of stormwater and dry weather runoff that enters the lagoon. The County's project also includes low flow diversion for the Termino Avenue drain watershed area, such that dry-weather discharges are diverted into a nearby existing sanitary sewer line and to the County Sanitation District sewage treatment plant. In addition, the proposed plan includes construction of an in-line trash screening device (Continuous Deflective Separator) to remove solids and flotsam from urban runoff and light storm flows prior to discharging into the lagoon or Marine Stadium (County of Los Angeles, undated). Connecting other major drains into the Termino Avenue storm drain line, if possible, would also improve lagoon water quality. The Termino Avenue drain outlet is shown on the following page.

4.6. *USE OF GREENBELT FOR TREATMENT WETLAND / WATER DETENTION BASIN*

Adjacent to the western arm of the lagoon is the old Pacific Electric railway right-of-way which is now an open space area called the "greenbelt." Several storm drains discharge into the lagoon in this vicinity. This open area could be used to build bioswales and/or a water detention basin for storm water runoff. However, this opportunity would be superceded by the proposed diversion of the Termino Avenue storm drain.

4.7. *LOCAL COMMUNITY STEWARDSHIP*

In 1999, a group of residents formed the Friends of Colorado Lagoon (FOCL) specifically to advocate for improving the lagoon. This provides for an opportunity to synergize efforts with this group for community outreach and educational activities. Also, several schools exist nearby that can utilize the lagoon for science activities (many of which already do utilize the lagoon for class science projects). FOCL and the City can incorporate the lagoon into local academics to produce many future stewards.

4.8. *PUBLIC USE ENHANCEMENT*

There are open areas around the lagoon which could be utilized to install interpretive elements (e.g. kiosks), a walking trail around the perimeter, and/or park benches. This would enhance the public enjoyment and recreational opportunities of the lagoon, as well as educating the public on sensitive habitats. Improved City maintenance (trash management) practices would also enhance the public enjoyment of the lagoon.

The City of Long Beach is currently working with FOCL to restore an old snack shop building at the lagoon and convert it to a Marine Science Education Center; this provides

for a great opportunity to synergize with this effort for educational outreach. There is another opportunity to work with the City's existing "Adopt-a-Wetlands" program. This program allows a "group or organization to adopt a park in the City of Long Beach;" responsibility is assumed for one year for litter removal, beautification, major or minor improvements, or any combination of the above. This program is already active at the Colorado Lagoon.

5.0 PRELIMINARY RESTORATION ALTERNATIVES

Based on the opportunities and constraints listed above, the following alternative components have been identified. These components will be assembled into three potential alternatives that will be developed and evaluated in the future alternatives deliverable. These alternatives have a range in cost from highest to lowest, with an intermediate option. The components listed below are in no particular order.

- Remove the 6th Street access road and/or make it narrower; utilize this land to bio-stabilize slopes and/or create pedestrian walking trail.
- Replace the golf-course perimeter chain link fence with bio-swales/berms.
- Utilize the western arm unused grassy area and sandy beach and/or the north shore sandy beach area for habitat restoration.
- Screen the western arm golf-course 7th tee, eliminate the long-tee playing option, or relocate this tee.
- Lay back steep slopes along western arm, northern arm, and by tidal culvert to create/improve intertidal habitat.
- Replace iceplant on the eastern shore with native plants.
- Clean out the tidal culvert.
- Remove the culvert structural impedances.
- Repair tide gates so they can open fully.
- Replace the box culvert with an open channel.
- Implement watershed area BMPs.
- Synergize with the proposed Termino Avenue Drain Project.
- Use the Greenbelt for a treatment wetland / water detention basin; and
- Enhance public use.

There are several other alternatives which are not necessarily "opportunities," but which would improve water and sediment quality for habitat restoration. These include:

- Removal of contaminated sediments.
    - Reference the "Colorado Lagoon Sediment Testing and Material Disposal Report" for further details.

- Storm Sewer Drop Inlets / Catch Basin Filters
    - Drop inlet grates and filters can be used in areas with the potential for elevated amounts of litter. Concentrated commercial areas should initially be considered for placement. A sampling and analysis program should be developed to quantify reduction over time. If a reduction in solids is not quantified, this placement should not be implemented.
- Detention Facilities
    - Areas within the Long Beach Recreation Park Golf Course exist that could provide necessary space for water retention/detention facilities and which would not impede play on the course. However, the cost associated for the design and construction of detention facilities and annual maintenance operating expenditures may not be practical.
- Dry Weather Diversion
    - Dry weather diversion to the sanitary sewer via a new pipeline or utilization of the proposed Termino Avenue drain can be accomplished. Further studies will need to be performed to determine the necessary hydraulic capacity of the diversion line and applicable rates of flow. However, the watershed area (Basin 21) is predominately residential, and as such dry weather diversion may not provide a significant decrease in pollutant concentrations discharged to the lagoon.
- Improvement of trash management protocols
    - Local residents have identified trash management as a needed approach to improve environmental quality at the site. More frequent and effective trash management will reduce flotsam at the lagoon. Potential improvements include ensuring that all trash containers are covered, providing additional containers at key locations, educating and/or enforcing littering prevention.
- Implementation of bird management protocols
    - An option to reduce bacteria inputs is to manage waterfowl by removing and prohibiting release of domestic birds such as ducks and geese. Other municipalities have installed signs discouraging feeding domestic waterfowl to reduce duck populations and their excretions. They have also enacted local laws prohibiting release of domestic birds to such locations. Results have been successful in Fullerton, for example, where domestic bird populations have declined from over 200 to less than 25 within the last two years.

The items listed above have been assembled into three <u>preliminary</u> alternatives:

<u>Alternative 1 – Minimal Modifications</u>

1. Clean culvert.
2. Remove exotic vegetation, plus install limited areas native vegetation.

3. Remove contaminated sediment from western arm.
4. Screen encroachment with vegetation.
5. Implement watershed BMPs.
6. Improve beach trash management protocols.
7. Implement bird management protocols.

Alternative 2 – Moderate Modifications

1. Do 1 above, plus remove culvert impedances and fix tide gates.
2. Do 2 above, plus install more extensive areas of native vegetation.
3. Do 3 above, plus minor recontouring of central lagoon bed to create more even bed slope condition.
4. Do 4 above, plus move the golf course fence back and install a 7th hole driving screen.
5. Do 5 above.
6. Do 6 above.
7. Do 7 above.
8. Install perimeter walking trail and interpretive kiosks.

Alternative 3 – Maximum Modifications

1. Remove culvert and replace it with an open channel.
2. Do 2 above, plus recontour side slopes to expand saltmarsh and create bermed buffer area.
3. Do 3 above, plus remove compromised sediment from the central lagoon for use as berms on-site referenced in item 2 above.
4. Do 4 above, plus pull back all hardscape encroachment, such as the access road and parking lot.
5. Do 5 above.
6. Do 6 above.
7. Do 7 above.
8. Do 8 above.
9. Divert low flow runoff from selected storm drains to the sanitary sewer.

These alternatives will be refined and assessed as part of the upcoming Task 9 "Develop and Evaluate Restoration Alternatives."

6.0 CONCLUSIONS

The previous tasks performed for this project have led to the identification of many opportunities for habitat restoration at the Colorado Lagoon, along with several constraints. The constraints include: a) physical constraints such as surrounding neighborhoods and golf course encroachment, culvert capacity limitations, and topography which dictates the lagoon as a low point storm drain basin; b) infrastructure constraints such as sanitation district capacity limitations, flood control, and City staff limitations; c) recreational constraints such as safe swimming and golf course use; and d) legal constraints such as LCP requirements, Coastal Act restrictions, and special status species considerations. The opportunities include: a) utilization of surrounding areas to provide habitat areas, b) a range of options to improve the culvert connection, c) educational and enforcement opportunities within the watershed area, d) synergy with existing efforts, and e) public use enhancement.

Three alternatives have been identified based on these opportunities and constraints. The alternatives are designed such that they range from minor modifications to major modifications. The alternatives listed in Section 5.0 are preliminary, and will be refined as part of the upcoming Task 9 "Develop and Evaluate Restoration Alternatives."

It should be noted that this is a draft report. The findings in this draft report will be presented to the TAC, CLAG and community stakeholders at the September 16, 2004 public meeting. This report will be updated, as necessary, to incorporate comments from the meeting.

7.0 REFERENCES

Boyle Engineering Corporation, prepared for City of Long Beach, "Investigative Information: Colorado Lagoon Water Quality", Nov. 2002, rev. March 2003.

"City of Long Beach, California, Local Coastal Program"; Adopted by the City Council on February 12, 1980; Certified by the California Coastal Commission on July 22, 1980.

City of Long Beach, "Work Program, Colorado Lagoon Restoration Feasibility Work Program", December 2003.

County of Los Angeles, "Termino Avenue Drain Project Opportunities and Constraints Analysis", Draft, Undated